Control-Temperature (CT) Dewar Prepping

1. After mounting your sample, the CT insulating vacuum should be pumped on until the pressure level is in the 10^{-5} range for a liquid nitrogen (LN_2) experiment, or at least 10^{-4} for a liquid helium (LHe) experiment (this assumes that there is no helium in the vacuum jacket!).
2. Once the insulating vacuum is established, liquid nitrogen should be placed in both reservoirs to pre-cool the cryostat. It is generally a good idea to leave the LN_2 in the central LHe reservoir for at least half an hour, to ensure that the sample and cryostat are thoroughly cooled. Four or five inches of liquid is sufficient. The sample temperature can be monitored using the appropriate temperature controller. Once gas pressure builds in the LHe reservoir, the control valve on the capillary vent can be opened to hasten cooling of the sample block to 78-80K.
3. Blow the remaining LN_2 out of the LHe reservoir by inserting a 3/8" tube through the top cap (with the O-ring seal to maintain gas pressure!). Attach a hose from a helium cylinder to the venting hose on the neck of the cryostat and establish several psi of pressure. WARNING: the LN_2 will come spurting out the tube: be careful where it is directed! Civic-minded experimenters will blow it into a small storage dewar. At least be careful not to freeze and crack anything (or anybody). Safety glasses or goggles should be worn. Cryogenic gloves are optional.
4. Once the liquid has stopped blowing out, transfer the helium gas to the mouth of the tube and blow warm gas down the throat for several minutes. When you

believe the liquid is gone, remove the tube. Insert a brown 5/32" "dip-stick" into the reservoir, then remove it and wave it gently in the air. If any liquid remains in the reservoir, the stick will frost up to the level of the liquid. Slight frosting at the very bottom, where it touches the reservoir, is to be expected. If there is evidence of LN_2 still in the reservoir, you should go back to step 3. Otherwise, pressurize the LHe reservoir with gas and blow it thought the capillary for several minutes. At the same time, set the temperature controller to maintain the sample block above 80K, which will ensure that no LN_2 remains. A bit of patience and care is recommended here; excessive haste may lead to the capillary freezing up and the necessity of completely warming up the CT and starting over. Once the capillary ahs been thoroughly flushed out, continue to the transfer of LHe.

5. For general procedures on LHe transfer, see the appropriate section. If you have any questions or uncertainties, seek assistance. It will take 10-15 liters of LHe to cool and fill the CT. Make sure there is enough in the LHe storage dewar you are using. Use a LHe "flutter tube" to check it.

6. The level of LHe in the cryostat should be checked, just to be sage, using the flutter tube. It should be 9" off the bottom of the reservoir. Measure the level on the LHe storage dewar as well, and record it on the tag. Be sure to close the top valve on the LHe storage dewar and open the right angle valve leading to the pressure release valve.

7. The LN_2 should be filled each day, though it will normally last 36 hours or more. The LHe should last 2-3 days, depending upon the care with which the

flow control valve is set, and how much warming and cooling are done. It is safest to check daily with a flutter tube; when you take the top off the reservoir, pressure will be relieved and the sample may warm slightly. Careful insertion of the flutter tube will not waste much helium.

WARNING: try to avoid breaking the insulating vacuum when cold: there is super-insulation in the vacuum jackets, which will effectively absorb a great deal of moisture from the air when cold. It makes subsequent pump-downs much more difficult! As a general practice, let the cryostat warm up before removing your sample if at all possible; after removing it, rough pump the vacuum to keep it clean. Try not to leave the vacuum jacket open to the air any longer than necessary.

From *NIST Reactor Radiation Division Cryogenics Manual* March 1993